FLIGHT SAFETY FOUNDATION
HUMAN FACTORS & AVIATION MEDICINE
Vol. 36 No. 4 | For Everyone Concerned with the Safety of Flight | July/August 1989

Northwest 255 at DTW: Anatomy of a Human Error Accident

Challenge and response, leadership and followship, advocacy and inquiry are the bipolar descriptors of team performance...the record in this accident reveals little of these factors at play, says the author.

by

John K. Lauber
Member, U.S. National Transportation Safety Board

(From remarks presented before the Flight Safety Foundation's 34th Annual Corporate Aviation Safety Seminar in Dearborn, Mich., U.S., April 1989)

On August 16, 1987, a McDonnell Douglas MD-80 operated by Northwest Airlines crashed on takeoff from Runway 3C at Detroit's Metropolitan Wayne County Airport (DTW). There was only one survivor — a four-year-old girl — among the 149 passengers and six crew members on the aircraft. Two persons on the ground were also fatally injured.

Our investigation revealed that the aircraft was not properly configured for the takeoff — the flaps and slats were in the up and retracted position — and consequently the aircraft did not achieve sufficient performance to climb above obstacles. Our probable cause cited the failure of the cockpit crew to perform the taxi checklist; a contributing factor was the interruption of electrical power, for reasons unknown, to the takeoff configuration warning system.

The crash of Northwest Flight 225 (NW255) was a human error accident, and to some, this may be a sufficient explanation of the tragedy. However, to stop here would in and of itself be a tragedy. No accident, no matter how seemingly simple, is the result of a single failure or factor. Likewise, no human error, no matter how grievous, is the result of a single cause or factor. The behavior of individual pilots never occurs in a vacuum but, rather, always occurs in an organizational context, in a climate created and affected by the actions and decisions of other individuals. We will be virtually guaranteeing another accident much like it in the future if we fail to understand that, while the actions of the pilots of NW225 directly caused the accident, responsibility for it is shared my many others.

The pilots on board NW255 were no different than the rest of us, and until we can understand that what happened to them can also happen to us, we too are vulnerable, and could well end up causing another "human error" accident. I want to try to put the performance of the pilots of NW255 in context, so that we can better understand what went wrong, and thereby be in a better position for preventing repetition of an avoidable tragic event.

The Sequence of Events

The flight crew picked up the accident aircraft in Minneapolis on the morning of August 16, and operated as Northwest Flight 750 to Saginaw, Mich., via Detroit. A pilot jump-seat rider who got off the airplane in Saginaw reported that he heard the Central Aural Warning System (CAWS) annunciate "flaps, flaps" during the taxi-in at Saginaw. He reportedly remembered thinking to himself, "Gee, this airplane even talks to you."

NW255 departed Saginaw at about 1853 hours and arrived at the gate at DTW about 1942. During the taxi-in, the aircraft passed its assigned gate, and had to execute a 180 to return. Otherwise, the flight was unremarkable.

After the aircraft was serviced and loaded for the continuation of its trip to Santa Ana via Phoenix, it was pushed back from the gate. During the pushback, the before-start checklist was accomplished, and the crew began starting the engines. At 2034:50, the flight was cleared to "taxi via the ramp, hold short of (Taxiway) Delta, and expect Runway Three Center (for takeoff)." They were also asked whether they had the current ATIS information "H," and replied that they did. The controller then cleared them to exit the ramp at Taxiway Charlie for taxi to Runway 3C, and instructed them to contact Ground Control on 119.45 MHz. The first officer repeated the clearance, but not the new frequency, nor did he retune his radio. He told the captain, "Charlie for three center, right." Seven seconds later, he told the captain that he was leaving the No. 1 radio, which was being used for ATC communications, "to get the new ATIS," which began to be recorded on the first officer's radio channel on the Cockpit Voice Recorder some 37 seconds previously. The knowledgeable reader will have tallied three discrete "slips" during this first minute of NW255.

Information "H" stated, in part, that "low-level windshear advisories are in effect ..."

At 2035:38, the captain asked "... did we get a head count?" Just as the first officer began to copy Information "H", a flight attendant reported in with a full head count, and continued to engage in a discussion with the captain about jump seat occupancy, a discussion which included an invitation from the captain to the flight attendant to occupy the cockpit jumpseat during the takeoff. This offer was declined with "... naw, takeoffs are boring..." Now well into the taxi, the captain interspersed a comment at 2036:40 "trim setting," followed immediately with a reference to the aircraft's weight which in turn prompted the captain to ask, "We're OK for that center runway, aren't we?" This occurred at 2037:08.

The computer-generated dispatch package contained information only for Runways 21R and 21L, but due to a wind shift, the operations were shifted to Runways 3R, 3C, and 3L. Thus, the first officer started to look for the requested information, and within 15 seconds of when he said, "I'll check," the captain asked, "Where's Charlie at?" a reference to Taxiway Charlie which they have already taxied by. During the next 30 seconds there is discussion between the captain and the first officer about where Taxiway Charlie is, and at 2038:01 the first officer told ground control "guess we went by Charlie." Ground Control provided NW255 with alternate directions, and then reiterated the frequency change originally issued two minutes and 20 seconds earlier. During this period, the captain said, "...I was thinkin' two one...I just you know ah we landed two one — both times."

At 2038:31, Ground Control asked "Northwest 255, are you on the frequency?" and the copilot responded with, "Yeah we are...nobody turned us over until just now when I called him back." Ground Control issued further taxi instructions and a further reference to ATIS Information "H" which were acknowledged by the first officer, who then engaged the controller in an exchange involving the frequency changeover in which the controller said, "...the controller said that he switched you over...," and the first officer responded with, "Well, we didn't acknowledge."

Fifteen seconds after the culmination of that exchange, the copilot reported the results of his search for the weight limitations for Runway 3C by saying, "Yeah, we're good." Approximately 20 more seconds were spent discussing the weight and temperature data, and at 2040:37, the communications radio was switched to the tower control frequency which the crew continued to monitor. Between 2041:03 and 2042:08, the captain engaged in a discussion about aircraft they saw through the windscreen, a discussion which included reference to Gulfstreams, Jetstreams, and Embraers, and whether what they were looking at was one of those. This discussion concluded when the aircraft arrived at the departure end of Runway 3C when the copilot reported to tower, "Northwest 255's ready on the center."

The tower controller cleared the flight, "...into position and hold...you'll have about three minutes on the runway (for) in trail separation behind traffic just departing," at 2042:11. The copilot made a PA announcement at 2042:36, and approximately twenty seconds later the captain said, "...blacker than # out there," in apparent reference to a small storm cell northwest of the airport. Four seconds after this remark, the copilot initiated the before-takeoff checklist by stating the first item on it, “transponder is set and on.” The remaining two items (CAWS annunciator and ignition) were completed, followed by nearly 30 seconds of no cockpit conversation which was terminated when the captain stated, again referring to the weather to the northwest, “Well, we ain’t going left.” This was concurred with by the copilot.

At 2044:08, following 22 seconds of cockpit silence, tower said, “Northwest two fifty five Runway Three Center turn right heading zero six zero, cleared for takeoff.” The copilot acknowledged, and within about five seconds, sounds of brake release and increasing engine power are heard on the CVR. About fifteen seconds after brake release, the captain is recorded as saying, “Won’t stay on,” which is followed by a clicking sound, more “Won’t go on...won’t stay on,” followed by more clicks. At 2044:39 the captain said, “TCI [Thrust Computer Indicator] was un-set...can you get ‘em now...there you go...they’re on now-clamp.” Two seconds later, the captain made the 100 knots callout, followed within 10 seconds by the V_1 and V_R callouts. At 2045:05 the sound of the stick shaker started and continued to the end of the tape.

The secondary stall recognition aural warning started at 2045:09 and repeated three times, during which an unidentified voice said, “...right up to the vee bar.” The sound of first impact was recorded at 2045:19, and the recording ended approximately five seconds later.

Major Human Performance Issues

Examination of the aircraft wreckage, review of other physical evidence, and supporting laboratory, simulation, and analytic studies established conclusively that the wing flaps and slats were not set for takeoff. A major act of omission — failure to position the flap/slat lever — was never detected and corrected by the flight crew prior to the initiation of their takeoff roll. Yet, there was ample indication of this initial failure throughout the roughly 11 minutes which elapsed between the approximate time that the flaps would normally have been lowered and the accident. There were several opportunities for the crew to have discovered the problem, and the aircraft itself was equipped with a sophisticated warning system which should have alerted the flight crew early in the takeoff roll to the fact that the aircraft was not properly configured — it, too, failed, for reasons not fully determined. And thus the accident happened.

How could a well-trained, experienced, professional flight crew miss something so basic and fundamental to virtually any flying operation? How could a modern state-of-the-art aircraft become an instrument of terrible destruction because of a failure so readily detectable and so easily correctable? Answers to these questions are not easily obtainable, but I want to try to dissect what I believe are some (certainly not all) of the most significant human performance issues involved in this major accident.

Task Structure and the Design and Utilization of Checklists

The fundamental failure in the sequence of events leading to the accident was the failure to position the flap/slat handle. This was followed by an equally fundamental omission — failure to run the taxi checklist, the only checklist which includes flaps and slats as a checked item. Understanding how these two critical failures could occur is central to understanding how this accident occurred.

Much of skilled performance is sequential in nature, and may be viewed as consisting of a series of interrelated “scripts,” each of which gets triggered by preceding events and activities. Thus, for example, prior to departure from the gate, the pilot, copilot and a flight attendant discussed that, “...we got the plane full — what are we waitin’ on now — weight tab?” After a brief discussion, the captain said, “Why don’t you tell them we’re ready to go,” which prompted the copilot to so inform the ramp controller. About 20 seconds later, ramp cleared NW255 to push back, which the copilot relayed to the captain. This event — receipt of the pushback clearance — triggered the captain (after a little reminder from the copilot) to say, “Let’s do the (before-start) checklist.” Completion of the before-start checklist, in turn, triggered an inquiry from the cockpit to the ground handler about whether they were cleared to start. That clearance was given, and the engine starting procedures were accomplished next. Successful starting of both engines prompted the after-start checklist, which was accomplished, and in turn, cued the first officer to request the taxi clearance, which was given in due course.

This is a typical scenario — each succeeding script gets played out after being cued by preceding events. Branching to alternate scripts can also happen, thus changing the overall sequence of events. For example, a starting problem would trigger appropriate successive contingency events. Whenever anything interferes with or disrupts the normal sequence of scripts, it is possible for an entire script to be missed — never performed — and unless there are some specific checks later, a human operator may never become aware that some action sequence has not been accomplished. Furthermore, one failure can induce subsequent ones simply because of the absence of a specific cue to trigger a subsequent script.

It is interesting to examine the cockpit procedures used by Northwest and many other airlines in light of this sequential dependency noted above.

First, the simple act of positioning the flap/slat handle is a task reserved solely for the copilot. Without command or approval from the captain, the first officer is to move the flap/flat handle to the planned takeoff position at some unspecified point after the captain starts to taxi the aircraft. The general guidance given mentions criteria such as exiting the congested ramp area and making sure that the aircraft is clear of ground vehicles and personnel. There is no specific, definable event which triggers this script. Furthermore, there is only a single actor involved at this point — there is no command/response or challenge/response redundancy.

Similarly, initiation of the taxi checklist itself is not triggered by any specific event. According to Northwest procedures, the captain is to call for the taxi checklist at some point during the taxi operation, but there is no discrete event or time which would serve as a cue for doing so.

Normally, both of these events take place very early in the taxi sequence. Typically, as soon as the aircraft starts to move under its own power, the first officer would position the flap/slat handle, and simultaneously or very shortly thereafter, the crew would execute the taxi checklist, which does include a challenge/response check of the flap/slat system. Unfortunately, in this case neither of these took place. Almost as soon as the taxi clearance was received, the captain started to taxi the aircraft, and the copilot said, "I'm off one...I'm gonna get the new ATIS." The captain acknowledged this, and immediately inquired about the "head count" from the flight attendant, and then engaged in a discussion with the flight attendant about occupying the jump seat.

While the first officer was listening to the ATIS broadcast, the captain, still taxiing, inquired, "We're OK for that center runway aren't we...?" The first officer said he would check, and then the captain asked, "Where's (Taxiway) Charlie at?" This prompted more discussion within the cockpit, and then an exchange with the ground controller, which included a repeat of an earlier instruction to change frequencies. This entire sequence was followed by the first officer's report that their weight was within limits for Runway 3C. By the time the conversation between the captain and copilot about the weight and temperature was completed, the aircraft had been taxiing for very close to five minutes, and the crew was well past the point in their operation where the flaps and slats would normally be positioned and the taxi checklist accomplished. They were quickly leaving the window of opportunity where contextual cues would trigger these activities.

At this point, conversation between the pilots turned to non-operational themes, in this case about an aircraft they see somewhere in their vicinity. They discussed whether it might be an Embraer, a Gulfstream, or a Jetstream, and which commuter carriers operate such aircraft. It is a conversation quite typical of what takes place in cockpits during lulls in activity, when all the immediate tasks have been completed. This conversation started after a quiet period of just over a minute, and continued for about a minute, at the end of which the copilot contacted the tower with, "Northwest two fifty five's ready on the center."

They were now well beyond the point where flaps and slats and before-takeoff checklists would have occupied their attention — these items had virtually always (literally thousands of times) been long-completed by the time these pilots got to this stage of their flight. Furthermore, the only remaining checklist, the before-takeoff checklist, contained only final items (transponder, annunciator panel, and ignition) — no checks of aircraft configuration were included (after all, these had already been completed). Thus, the crew was now down to the point where only a chance observation (for which there was plenty of opportunity, but little historical reason for doing so) and the takeoff configuration warning system stood between NW255 and an accident. A critical script — actually, two — had slipped through, untriggered and unperformed. But, this was not the first time (nor the last) that such failures had occurred in airline flight operations.

Warning Systems: Are They Primary or Secondary?

The next major event in this accident happened within the first few seconds of the takeoff roll. At the time the brakes were released and the power levers were pushed up by the captain, the thrust came up past an Engine Pressure Ratio (EPR) of approximately 1.4. A sensor should have triggered the CAWS to, among other things, check aircraft configuration and report to the crew by means of a voice warning feature which literally says, "flaps, slats," if the flaps and/or slats are not properly positioned. It is quite clear from the CVR that no such warning was ever given. After this point had passed, only chance observation, which by this time was very improbable, would have made it possible for the crew to have detected the problem before becoming airborne.

Many other pilots, possibly even one or both of these, have been "saved by the bell." In fact, one such crew (of a Boeing 737) reported the same situation to NASA's Aviation Safety Reporting System (ASRS) within a few weeks of the Detroit accident, and I have no reason to believe that there haven't been others since. Thus, the absence of this critical warning was an event of major significance in this accident.

The interested reader may refer to the published report of this accident to determine the evidence and rationale behind our determination that the reason for the failure of the CAWS to alert the crew was because of an interruption of electrical power to a critical part of the system at a specific circuit breaker called the P40 breaker. Although we have conclusive evidence of this power interruption, we do not have sufficient information to determine which of three possible explanations — internal failure of the circuit breaker, an electrical transient which could have activated the breaker, or a deliberate act on the part of someone who had access to the cockpit breaker — was the cause of the power failure.

There has been considerable debate on whether we should have found this power interruption to be "causal" rather than the more distant "contributory" which we included in our probable cause. I believe this debate really hinges on the question of whether we recognize warning systems to be primary, essential, critical-to-flight items, or are they secondary backup systems, designed only to provide an in-depth defense against primary human or mechanical error? While it is easy to argue the latter, available evidence suggests that in fact, people develop a genuine dependency on such systems when they are available. If, in fact, people's behavior is conditioned by their interaction and experience with such systems, doesn't this argue in favor of the primacy position on this issue? (I'll leave the development of an answer to this question as an exercise for the interested reader.)

Hypothesis Testing, Mental Set, and Conservatism

During the final minute of NW255, there were several additional opportunities for the flight crew to discover their critical initial failure. However, because of some inherent characteristics of human behavior, I think it is unlikely in the extreme that any pilot unfortunate enough to be in the same situation would have performed any differently.

Immediately after brake release and the application of takeoff power, the captain and first officer engage in the following dialogue:

Time	Crew Member	Remark
44:28	Captain	"Won't stay on"
44:29	——	sound of click
44:30	Copilot	"Won't go on"
44:31	Captain	"But they won't stay on"
44:32	Copilot	"Okay, power's normal"
44:38	——	sound of click
44:39	Captain	"TCI was unset"
44:40	——	sound of click
44:42 —	Captain	"Can you get 'em now there you go"
44:43	Copilot	"they're on now — clamp"
44:46	Captain	"hundred knots"

Normal takeoff procedures on the MD-80 include the use of autothrottle once power is initially set manually. In order to engage the system, the TCI must be set — this is another item on the taxi checklist. From the above, it can be seen that the crew was having problems engaging the autothrottle, and that the captain found and corrected the problem during their takeoff acceleration ("TCI was unset").

Some have questioned why this discovery didn't cue the crew that they had failed to run the taxi checklist, and in the comfort of our armchairs, it seems like a reasonable question. However, it has long been experimentally demonstrated that people are very conservative decision-makers, especially when the decision involves abandonment of a previously held belief or view. Up to this point, there has been nothing to indicate to the crew that all was not normal. Their belief (or "theory of the situation," to borrow from Lee Bolman at Harvard), was that all was normal, and the fact that the TCI was unset was insufficient to cause them to seriously question that belief. In fact, even the subsequent events didn't generate any serious "hypothesis testing." Again, many pilots have found themselves in similar situations, and those who have been fortunate enough to survive have been retrospectively bewildered by their blindness at the time. (Incidentally, this may be one reason for the comparative effectiveness of flight safety awareness programs, and such publications as the ASRS *Callback* and *Flying* magazine's "I Learned About Flying From That" — these may trigger more effective "hypothesis testing.")

Within 15 seconds of the completion of the exchange quoted above, the aircraft was rotated, and the stick shaker started and continued to the end of the tape. This event, the onset of stick shaker, was the very first indication to the flight crew that something was seriously wrong with NW255. Additional corroborative information would have been the long ground roll, and the sound of the secondary stall recognition system. About this time, the Digital Flight Data Recorder (DFDR) shows that "Go Around" mode was selected on the flight director, and that the captain was making adjustments to the aircraft's pitch attitude which were basically satisfying the flight director commands. Simulation and performance analysis showed that had the pitch attitude been reduced in response to the stick shaker, the aircraft could have accelerated sufficiently to climb above the obstacles, and eventually make a safe departure. So why didn't the stick shaker and stall warning cause the crew to question the configuration of the aircraft? And why did the crew respond by increasing rather than decreasing pitch attitude?

Again, it is important to remember that this crew had no forewarning of a configuration problem with the airplane. Although the autothrottle problem early in the takeoff roll was a related clue, it was not sufficiently potent to cause the crew to question what had gone before. Instead of abandoning the old hypothesis that all is well with the airplane itself (which was not the case), this crew probably immediately developed a new one to "explain" their suddenly desperate situation — wind shear, a factor external to the aircraft (which was also not the case).

The final comment recorded on the CVR is "...right up to the vee bar," which is a reference to the flight director command bar, and was an indication of a control strategy consistent with a wind shear encounter. However, this had to be terribly confusing, because none of the other indications of wind shear would have been present. Most notably, indicated air speed would have been increasing steadily during this entire period. But this information would not have registered quickly in the mind of either pilot in view of a radio conversation they overheard earlier (while still at the gate) about another aircraft's encounter with wind shear, the information "H" ATIS wind shear alert message, and the threatening weather to the northwest which they visually observed.

Although the aircraft continued to accelerate, because of the high angle of attack achieved, a roll instability set in which was counteracted by control wheel deflections of sufficient magnitude that spoilers were activated in addition to the ailerons. The extension of spoiler panels for roll control further reduced the already marginal climb performance of the aircraft, thus making the accident unavoidable from that point on. In any event, there is no indication that the pilots of NW255 ever recognized that they had made a no-flap takeoff. Most of their fellow pilots who had made the same fundamental error of omission had been fortunate enough to have discovered or had been warned of the problem before they became airborne. Those few who have become airborne, and who successfully flew out of the situation were fortunate, indeed.

Other Factors Affecting Human Performance

There are many other factors which affected the performance of the pilots individually and collectively in this accident. At the most global level was the unsettling nature of the economic upheavals within the airline industry caused by deregulation of the industry nearly a decade earlier. Somewhat more concrete were the changes attendant to the merger of Republic, the parent airline for these pilots, and Northwest — their new home. By all accounts, there were major differences in the corporate culture of these two organizations, and being forced to accommodate to such major changes after a lengthy career (the captain was 57) can be personally traumatic. Even more concrete were the perceived effects or anticipated effects, whether valid or not, of the recent forced downgrading of the captain from the Boeing 757 to the MD-80 upon his pay and status. [Future FSF bulletin articles will deal in-depth with the dilemma of corporate upheavals. —Ed.]

In addition to these background issues, some factors specific to this flight also are worthy of consideration. Most important of these were schedule pressures; the flight left the gate 33 minutes late, and faced the prospect of additional delays due to weather in the Detroit area, and the possibility of en route delays or reroutes due to turbulent weather on their route of flight. The problem was not just the delay per se. Due to the existence of a curfew at their California destination, any significant further delay would have caused even more difficulties for this crew in what would already be a long day for them. Can it be proved that any of these factors directly affected the performance of the pilots? No, probably not. Do I believe they did? Without doubt.

Solutions

If the performance of individuals is so fragile that it can be critically disrupted by factors such as these, what hope is there that we will ever prevent such accidents from happening in the future? Implicit in the discussion above are some measures which present some opportunities for preventing future accidents of this kind. I want to briefly discuss what I believe to be the more significant of these.

One step which can be taken addresses the issues of operating procedures and checklist design and use. As I indicated above, this was a critical factor in the initial errors of omission — the failure to lower the flaps and to run the taxi checklist. Procedures and checklists must be designed to be cued by discrete, identifiable events. For example, initiation of the taxi itself, or departure from the ramp may be tied to the conduct of the taxi itself, or departure from the ramp may be tied to the conduct of the taxi checklist. Furthermore, procedures and actual practice should clearly specify who is responsible for the initiation of such checklists, and a high degree of emphasis in training and checking programs should be placed upon the importance of making these procedures invariant.

Additionally, checks for flight critical ("killer") items should be replicated, formally and informally. Formally they can be in the form of another discrete check (a step which many carriers have adopted following this accident), and informally as an act of basic airmanship (a step which many professional pilots routinely conduct just prior to initiating the takeoff roll).

Another step involves the question of handling disruptions or distractions, some of which are not under control of the crew, and others of which are. It must be recognized that any disruption or interruption of sequentially dependent tasks is associated with a high probability that some or all of the elements of these tasks may be missed entirely, especially if any significant amount of time passes during the period of interruption. Thus, operating procedures should explicitly state that any interruption to an ongoing sequence of activities, especially running checklists, will automatically trigger a restart of the process which was interrupted. Obviously, this has to be done in a reasonable manner, but it should be the dominant mode of operation for all pilots.

Another area which I will only briefly mention is the design of cockpit warning systems, and their use, including functional checks of these systems prior to flight. We made several recommendations on this subject in our report, and I'll not more fully address them here.

And finally, let me mention an area with which I have long been associated. One of the reasons I have been such a strong advocate of cockpit resource management training, which includes as a major element the issue of team as opposed to individual performance, is because I believe this is one of the few effective weapons we have in this fight against human error accidents. We must recognize that individual performance can be greatly affected by seemingly minor, often unknown, factors. Challenge and response, leadership and followership, advocacy and inquiry are the bipolar descriptors of team performance, and unfortunately, the available record in this accident reveals little of these factors at play.

Thoughtful analysis of the CVR transcript shows little evidence of team performance and, instead, reveals a relationship most definitely not conducive to effective monitoring, crosschecking and communications. I believe this was the most fundamental human performance problem of all in this accident, and helped set the stage for the initial failure — to position the flaps and slats — and to ensure that failure, which could and has happened for a variety of reasons, would not be discovered except well after the fact, by accident investigators examining the wreckage of NW255. ♦

About the Author

Dr. John K. Lauber was appointed to the U.S. National Transportation Safety Board in November 1985, by President Ronald Reagan and will continue at NTSB until December, 1989. Before joining NTSB, he served as Chief of the Aeronautical Human Factors Research Office for the National Aeronautics and Space Administration's Ames Research Center at Moffett Field, California.

After graduating in 1969 from Ohio State University with a doctorate in psychology, Lauber joined the staff of the Human Factors Laboratory at the U.S. Naval Training Devices Center in Orlando. In 1973, he left the Center to continue his research in aviation humanmanagement at Ames Research Center.

Lauber's accomplishments and honors include election to the Aerospace Medical Association in 1983, appointment as President of the Association of Aviation Psychologists (from 1979 to 1981), membership in the Human Factors Society as well as other national and international committees and commissions. In 1985, he was presented with NASA's Outstanding Leadership Award. In 1987, he received the Flight Safety Foundation/Aviation Week and Space Technology's Distinguished Service Award in recognition of his service to the cause of aviation safety.

Lauber holds a Commercial pilot's license with single- and multi-engine instrument ratings for airplane and helicopter, and is type-rated in the Boeing 727.

The Trap of Complacency

The old adage "Familiarity Breeds Contempt" is as true today as it was when it was first coined many years ago.

Complacency is a trap for the more experienced pilot. It is a slow killer with many disguises. Sometimes it is considered as recklessness, sometimes as boredom or inattention.

The cause of complacency is faith that we must have as pilots. Faith is a result of training, experience and personality. On flights that are routine, work is often done automatically and details may get less attention. By being successful in the job for quite a period, the seduction to trust your routine gets stronger. Complacency is similar to a lack of oxygen; the pilot who is the victim does not notice his decline, and his self-criticism weakens. The next story is a good example of complacency.

The crew was scheduled for a flight in a twin-engine aircraft. During the checks, it was noticed that the autopilot and yaw damper did not operate properly. Without checking further, the captain declared the aircraft unserviceable and asked for another one.

The crew was assigned another aircraft, only the right engine had be be checked and it was found to run properly. The first officer reported to the captain that the amount of fuel was 500 pounds less than planned. Due to some extra delays, the takeoff took place half an hour after starting the right engine.

The first officer passed the fuel problem to the captain again, who answered, "We still have enough fuel."

During the trip, a strong headwind was encountered and, because the center of gravity was not optimum, the ground speed was 50 knots less than planned.

At a distance of 13 nautical miles from the destination, the right engine low-level fuel caution light went on. After some hesitation, the captain did not see any reason to land immediately and refuel because he had always had too much fuel on this trip. The weather was: visibility slightly less than a mile and a-half, cloud base 200 feet. During the descent, the left engine low-level fuel caution light went on. The captain did not see a reason for crossfeeding. The right engine shortly stopped. The captain then re-started it with crossfeed from the left tank. At five nautical miles both engines stopped and the aircraft crashed on an automobile. The captain was killed and the first officer badly injured.

All the symptoms of complacency were there: a pilot with much experience, poor flight preparation, improper cargo placement, and a fuel shortage. "It can't happen to me." Be aware of complacency and remember there are limitations not only concerning weather and equipment, but also for yourself. ♦

HUMAN FACTORS & AVIATION MEDICINE

Copyright © 1989 FLIGHT SAFETY FOUNDATION, INC. ISSN 0898-5723

Articles in this publication may be reprinted in whole or in part, but credit must be given to *Human Factors & Aviation Medicine*. Please send two copies of reprinted material to the editor. Suggestions and opinions expressed in this publication belong to the author(s) and are not necessarily endorsed by Flight Safety Foundation. Content is not intended to take the place of information in company policy handbooks and equipment manuals, or to supersede government regulations. • Manuscripts must be accompanied by stamped and addressed return envelopes if authors want material returned. Reasonable care will be taken in handling manuscripts, but Flight Safety Foundation assumes no responsibility for material submitted. • Subscriptions : $50 U.S. (U.S. - Canada - Mexico), $55 Air Mail (all other countries), six issues yearly. • Staff: Pat Dade, layout assistant; Jacque Edwards, word processor; Arthur H. Sanfelici, consultant • Request address changes by mail and include old and new addresses. • Roger Rozelle, editor, Flight Safety Foundation, 2200 Wilson Boulevard, Suite 500, Arlington, VA 22201-3306 U.S. • Telephone: 703-522-8300 • Telex: 901176 FSF INC AGTN • FAX: 703-525-6047